



Installing the Chassis

This chapter describes how to install and test the Cisco Metro 1500 series system chassis. The equipment is installed during normal working hours. It is usually connected to active CPU channels or control units after working hours.

This chapter includes the following sections:

- Before Installing, page 3-1
- Installing the System, page 3-4
- Connecting Power, page 3-8
- Cleaning the System, page 3-18
- Removing the Power Supply Module, page 3-21
- Running Online Tests, page 3-25
- Troubleshooting, page 3-28

Before Installing

Before you install the system, you must complete the following tasks:

- Unpacking and Inspecting the System
- Maintaining a Network Record
- Mounting the System

**Caution**

Use extreme care when removing or installing connectors so you do not damage the connector housing or scratch the end-face surface of the fiber. Always install protective covers on unused or disconnected components to prevent contamination. Always clean fiber connectors before installing them.

Unpacking and Inspecting the System

The Cisco Metro 1500 series system comes with the following standard items:

- Cisco Metro 1500 series hardware
- Substitute power-on key (AC powered version only)
- Mounting set
 - 19-in. adapter
 - rack screw
 - washers
- Two power cords for each chassis delivered
- Acrylic cover
- *Cisco Metro 1500 Series Hardware Installation Guide*
- *Cisco Metro 1500 Series Software Configuration Guide*
- *Release Notes for the Cisco Metro 1500 Series*

**Note**

The systems are used in pairs. Depending on your order, a total system package can consist of multiple boxes. All boxes are labeled with a summary of contents, and they are signed and verified by a packager. If an order includes more than one box, this summary will show the number of boxes shipped.

The Cisco Metro 1500 series system is thoroughly inspected before shipment. If any damage has occurred during transportation or if any item is missing, notify your Cisco customer service representative immediately.

Upon receipt, inspect the equipment as follows:

Step 1 Take inventory.

Compare the equipment inside with the packing slip and the equipment list provided by customer service. If there are any discrepancies, notify the Customer Service Center.

Step 2 Check for external damage.

Visually check all components and immediately report any shipping damage to your customer service representative. Have the following information ready:

- Invoice number of shipper (see packing slip)
 - Model and serial number of the damaged unit
 - Description of damage
 - Effect of damage on the installation
-

Maintaining a Network Record

Fill out all the required information in Appendix E, “Unit Maintenance and Network Record,” so you will have a record of all of your hardware, configuration options, and network settings.

Mounting the System

The unit is designed for rack-mounting in a cabinet. We recommend mounting up to four units in one vertical rack and using chassis runners or telescopic slides. Use star-type lock washers on the rack screws to ensure a good conductive connection between the unit and the rack. For further information about installing the units in a customer cabinet, see the instructions from the cabinet manufacturer.

**Caution**

Because of rack mounting, the plugs of the power cables on the rear side of the unit might not be accessible. Please provide a power circuit breaker to allow front power access. If you do not use a power circuit breaker, ensure quick access to the plug-socket combinations on the rear side of the unit at all times. In this case they serve as the main means of disconnecting.

Installing the System

**Warning**

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

To install, connect, and test the system, follow these steps:

-
- Step 1** Unpack and inspect each unit. Verify completeness against the packing list.
 - Step 2** Fill out the form in Appendix E, “Unit Maintenance and Network Record.”
 - Step 3** Mount each unit in a cabinet or a rack.
 - Step 4** Power up each unit.
 - Step 5** Run online tests as described in the “Running Online Tests” section on page 3-25.
 - Step 6** Connect the fiber-optic link between sites using the remote channel.
 - Step 7** Connect applications using the local channels.
 - Step 8** Test the system online to verify operation.

**Note**

If a network element management interface (NEMI) is not installed, you have completed this portion of the installation tasks. If a NEMI is installed, refer to the *Cisco Metro 1500 Series Software Configuration Guide* and continue with Step 9.

- Step 9** Connect to the serial port.

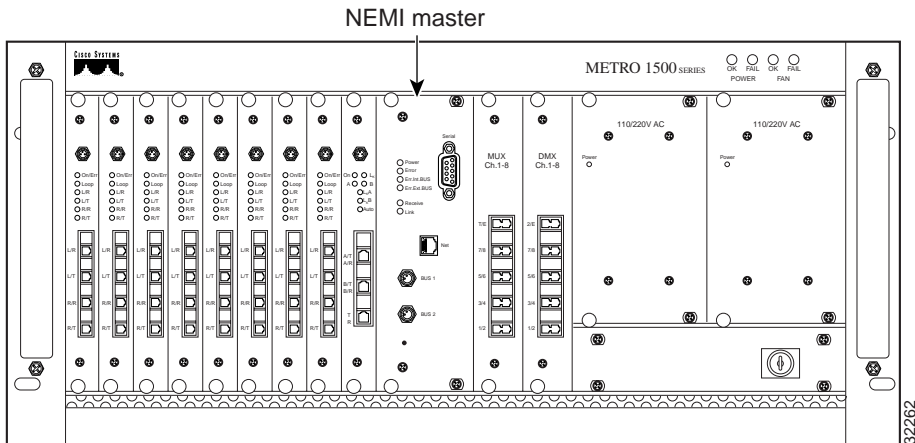
- Step 10** Change default passwords. See Appendix E, “Unit Maintenance and Network Record.”
- Step 11** Log in as root and define network settings. See Appendix E, “Unit Maintenance and Network Record.”
- Step 12** Change the SNMP configuration.
- Step 13** Reboot the unit.

Installing the NEMI Module

To install a NEMI module (master and slave, as applicable), follow these steps:

- Step 1** Remove the acrylic front cover from the unit in which the module should be added. (See Figure 3-1.)

Figure 3-1 NEMI Placement in the Primary Chassis and Extension Chassis B.



- Step 2** Remove the two screws from the blank filler module. Remove the blank filler panels.
- Step 3** Take the new module from the shipping container and use canned, dry, oil-free, compressed air to blow off any possible dust particles.

- Step 4** Insert the NEMI module carefully into the chassis slot while guiding the upper and lower edges of the module in the tracks until its connectors come into contact with the backplane connectors.

**Caution**

It is critical to insert the module gently. If you need a force greater than 1 lb (4.5 newton) to push in the module, stop immediately. Inspect the electrical connector. If the connector is not damaged, repeat Step 4.

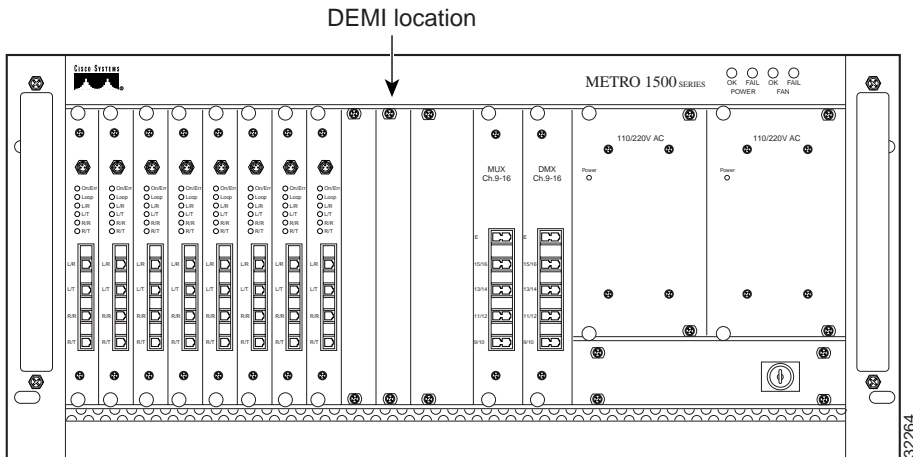
- Step 5** Hold the module in position after making full contact and use the two screws on the front panel of the module to secure it in the housing. When the module is in contact with the backplane, the green power LED is on.
- Step 6** Reset the NEMI modules (both master and slave, if applicable) by inserting a pointed tool into the small hole on the front panel within the first 30 seconds of installation. The green power LED comes on and the NEMI module starts up.
- Step 7** Save the blank filler panels with the packaging material.
-

Installing the DEMI Module

To install a DEMI module, follow these steps:

- Step 1** Remove the acrylic front cover from the unit in which the module should be added. (See Figure 3-2.)

Figure 3-2 DEMI Placement in Extension Chassis A and C



- Step 2** Remove the two screws from the blank filler module. Remove the blank filler panel.
- Step 3** Take the new module from the shipping container and use canned, dry, oil-free, compressed air to blow off any possible dust particles.
- Step 4** Insert the DEMI module carefully into the chassis slot while guiding the upper and lower edges of the module in the tracks until its connectors come into contact with the backplane connectors.



Caution

It is critical to insert the module gently. If you need a force greater than 1 lb (4.5 newton) to push in the module, stop immediately. Inspect the electrical connector. If the connector is not damaged, repeat Step 4.

- Step 5** Hold the module in position after making full contact and use the two screws on the front panel of the module to secure it in the housing. When the module is in contact with the backplane, the green power LED is on.
- Step 6** Save the blank filler panels with the packaging material.
-

Connecting Power

The system is equipped with two power supplies and two power cords. The power must be turned on by the power keyswitch on the AC-powered version only. The keyswitch is secured against rotation and the key can be removed in either the on or off position. A key for powering up the system is provided with each system.

When the power is on, all of the green power supply LEDs should be on for each power supply module (PSM) and wavelength channel module (WCM). The display panel provides important system information.



Warning

The plug-socket combination must be accessible at all times because it serves as the main disconnecting device.



Warning

This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit.



Caution

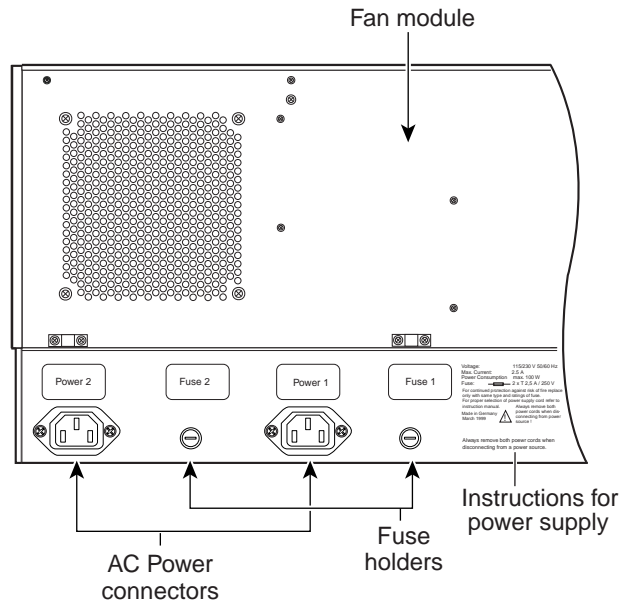
Please use approved extension cords or a power circuit breaker to allow front power access.

Connecting AC Power

To connect AC power, follow these steps:

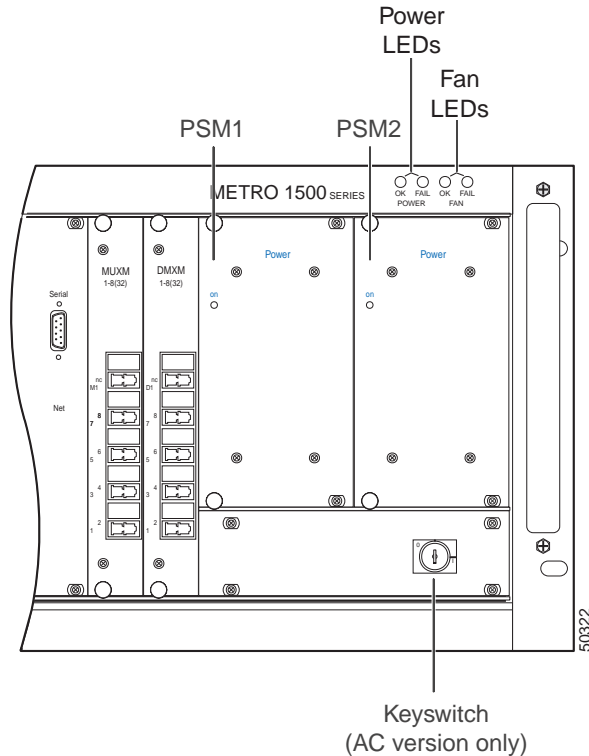
- Step 1** Connect the power supply cords to power 1 and power 2 on the rear panel of the unit. (See Figure 3-3.)

Figure 3-3 Rear Panel of the Cisco Metro 1500 (AC Version)



- Step 2** Connect the ends of the power supply cords to the main power supply source.
- Step 3** Turn the power on with the keyswitch at the front panel of the unit. (See Figure 3-4.)

Figure 3-4 Front Panel of the Cisco Metro 1500



The keyswitch is secured against rotation. The key can be removed in either the (0) or (|) position. A pair of keys for powering up is supplied with each system. Warm up the unit for 30 minutes before testing the laser power or connecting applications.

**Caution**

If powered down, wait at least 10 seconds before you switch the unit on again.

Connecting DC Power

The system is equipped with two PSMs and two DC power cables. There are two DC powered versions of the Cisco Metro 1500 Series. The European DC version uses the DC plug-socket combination. The US version uses terminal blocks. Depending on the type of connectors on the power distribution unit (PDU), you have to use the power cables for SELV applications or the power cables for all other centralized 48-VDC applications.

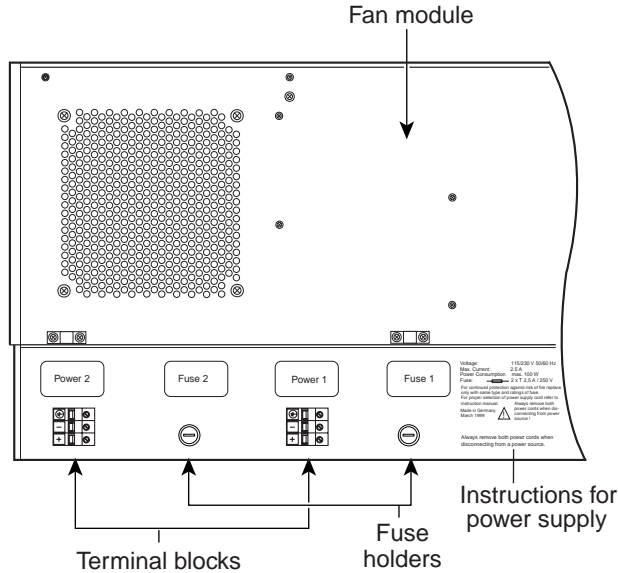
Installing Terminal Blocks (US Version)

The Cisco Metro 1500 series system is equipped with two PSMs. To connect the system to the PDU, you need two approved three-core interconnection cables.

To connect the power cables for the US version, follow these steps:

-
- Step 1** Remove the insulation of each wire on both ends of the interconnection cables at a length of about 5 mm.
 - Step 2** Connect the wires of the cables to the terminal blocks in the rear panel of the unit. (See Figure 3-5.)

Figure 3-5 Rear Panel of the PSM (US Version)



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**Caution**

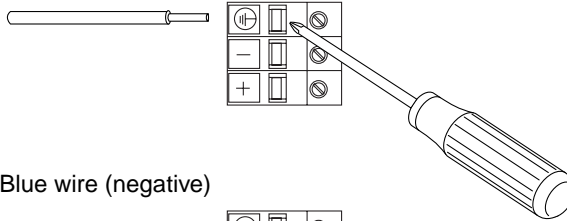
Do not use damaged terminal blocks. Immediately replace damaged or defective terminal blocks

Step 3

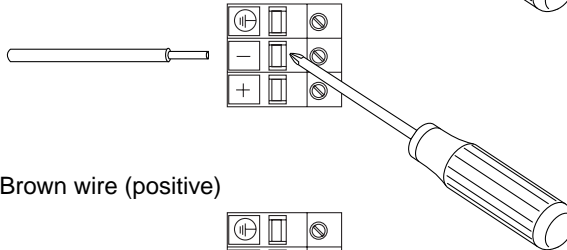
Take a medium screwdriver and push it into the rectangular hole of the terminal block. (See Figure 3-6.) At the same time, slide the insulation-free end of the wire into the respective rectangular hole at the bottom of the power clamp. Repeat this step for the other wires.

Figure 3-6 Connecting Wires

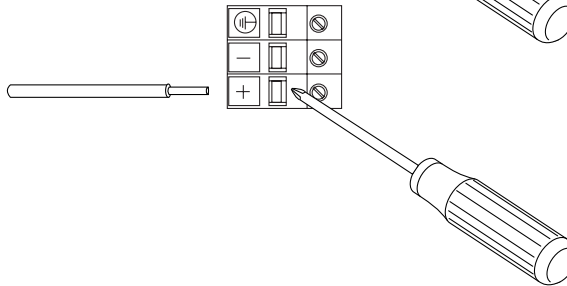
Green/yellow wire (ground)



Blue wire (negative)



Brown wire (positive)



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- Step 4** Connect the three wires on the other end to the corresponding high current connectors of the power distribution unit. Attach the wires to their respective points in the connectors.

**Caution**

Make sure that the three wires of the power cables are correctly fixed at the clamps of the PDU connectors.

**Caution**

Never connect blue (negative) or brown (positive) wires to the ground pin.

- Step 5** Turn the power on using the corresponding power switch of the PDU.

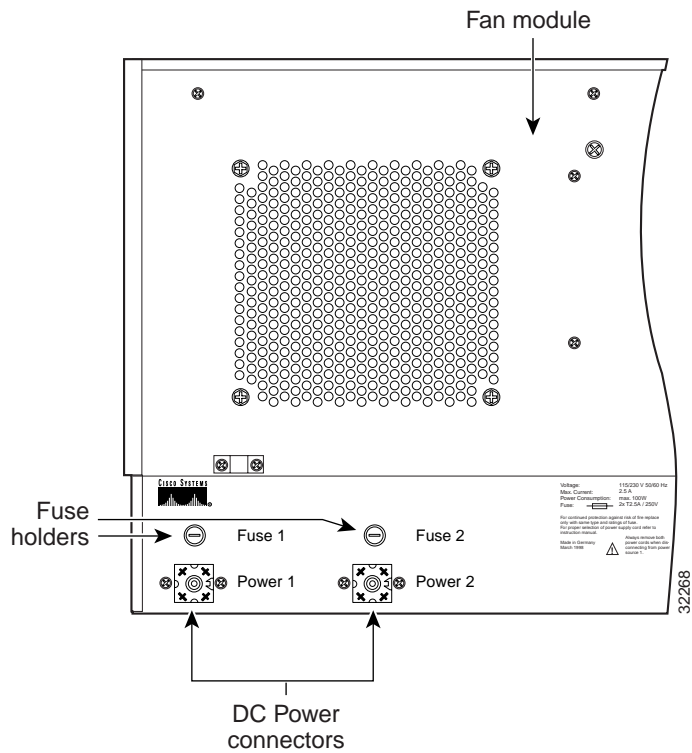
The chassis powers up as soon as the corresponding power switch of the PDU is turned on.

Installing the DC Plug-Socket Combination (European Version)

To connect the power cables for the European version, follow these steps:

- Step 1** Connect the desired power cables to power 1 and power 2 on the rear panel of the Cisco Metro 1500 series system and attach the plugs with the screws to the sockets. (See Figure 3-7.)

Figure 3-7 Rear Panel of the Cisco Metro 1500 (DC Version)

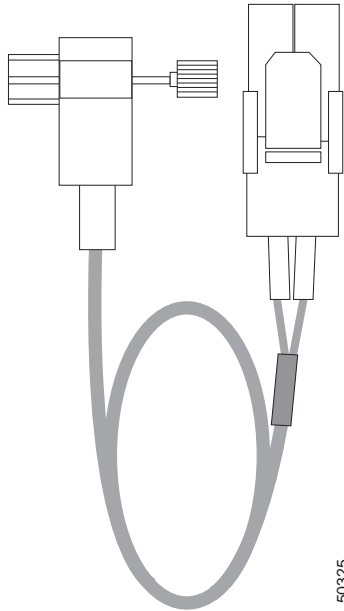


**Caution**

Tighten the screw of the plug to avoid loss of connection.

- Step 2** Choose the appropriate power cable.
- Step 3** Connect the plug (the power cable for the SELV application is fitted with a special plug) to the corresponding connector of the PDU. (See Figure 3-8.)

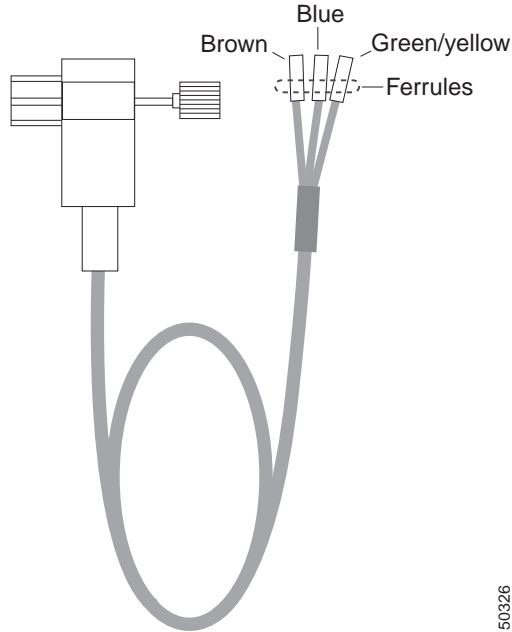
Figure 3-8 SELV Application Power Cable



- Step 4** Attach the three wires to their respective points in the corresponding connectors of the PDU as described as follows:

Brown wire	live	+
Blue wire	neutral	-
Green/ Yellow wire	ground	PE

The power cable for the 48 VDC application has wire ferrules on the other end. (See Figure 3-9.)

Figure 3-9 48 VDC Application Power Cable

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**Caution**

Make sure that the three wires on the power cables are correctly fixed at the terminal clamps of the unit and at the connectors of the PDU.

**Warning**

This warning applies only to units equipped with DC input power supplies. Wire the DC power supply using the appropriate lugs at the wiring end. The proper wiring sequence is ground to ground, positive to positive (line to L), and negative to negative (neutral to N). Note that the ground wire should always be connected first and disconnected last.

Step 5 Turn the power on using the corresponding power switch of the PDU.

The chassis powers up as soon as the corresponding power switch of the PDU is turned on. If the DC power cables are not connected to the PDU, the plug socket combinations on the rear end of the unit serve as switches.

Power Consumption and Power Supply Fuses

The system power consumption is less than 150 W.

Use the following fuses:

Power Type	Fuse Type	No. of Fuses
AC version	2.5A at 250V, slow blow, 5 x 20 mm	2
DC version	6.3A at 250V, slow blow, 5 x 20 mm	2



Caution

Always replace blown fuses with fuses of the same type and size.



Caution

Do not use damaged terminal blocks. Immediately replace damaged or defective terminal blocks.



Note

The 115/230V version automatically detects the input voltage. No further adjustment is necessary.

The Cisco Metro 1500 series system supports the following power sources:

AC	110 to 240V, 50 or 60 Hz
DC	-48 to -60V

Table 3-1 lists the power requirements in different countries.

Table 3-1 Power Requirements

Region	Power Requirements
North America	110 to 120 VAC, 60 Hz or -48 to -60 VDC
Europe	210 to 240 VAC, 50 Hz or -48 to -60 VDC

Grounding the Chassis

Connecting the power cords to the chassis provides basic grounding. You should also connect a separate grounding cable for each chassis to the rack. Use the ground contact on the right side of the chassis to make the grounding connection.

To ground the chassis, follow these steps:

-
- Step 1** Connect a wire to the earth contact on the right side of the chassis.
 - Step 2** Connect the other end of the wire to the rack.
-

Cleaning the System

This section describes how to clean the chassis and the connectors and includes the following sections:

- Cleaning the Chassis
- Cleaning the Connectors

Cleaning the Chassis

Be very careful with the air flow system when you clean the chassis. If the cleaning process has to be done while the system is on, be aware that the airflow system is in operation. Clean the chassis with a damp cloth only and be careful of the following:

- Do not touch the safety lattice of the airflow system while fans are operating.
- Do not use wet tissues for cleaning the product's outer housing.
- Do not use any harsh or abrasive cleaning agents.

Cleaning the Connectors

Fiber optic connectors are used to connect two fibers together. When these connectors are used in a communication system, proper connection becomes a critical factor.

Fiber optic cable connectors can be damaged by improper cleaning and connection procedures. Dirty or damaged fiber optic connectors can result in not repeatable or inaccurate communication.

Fiber optic connectors differ from electrical or microwave connectors. In a fiber optic system, light is transmitted through an extremely small fiber core. Because fiber cores are often 62.5 microns or less in diameter, and dust particles range from a tenth of a micron to several microns in diameter, dust and any contamination at the end of the fiber core can degrade the performance of the connector interface where the two cores meet. Therefore, the connector must be precisely aligned and the connector interface must be absolutely free of trapped foreign material.

Connector, or insertion, loss is a critical performance characteristic of a fiber optic connector. Return loss is also an important factor. It specifies the amount of reflected light; the lower the reflection the better the connection. The best physical contact connectors have return losses better than -40 dB, although -20 to -30 dB is more common.

The connection quality depends on two factors; the type of connector and the proper cleaning and connection techniques. Dirty fiber connectors are a common source of light loss. Keep the connectors clean at all times and keep the dust cover installed when not in use.

Before installing any type of cable or connector, use a lint-free alcohol pad from a cleaning kit to clean the ferrule, the protective white tube around the fiber, and the end-face surface of the fiber.

As a general rule, whenever there is a significant, unexplained loss of light, clean the connectors.

**Caution**

Use extreme care when removing or installing connectors so you do not damage the connector housing or scratch the end-face surface of the fiber. Always install protective covers on unused or disconnected components to prevent contamination. Always clean fiber connectors before installing them.

Use a swab saturated with isopropyl alcohol to clean the end-surfaces. Use dry, oil-free compressed air after applying the isopropyl alcohol.

To clean the optical connectors, follow these steps:

-
- Step 1** Gently wipe the ferrules and end-face surfaces of the connector with an alcohol pad from the cleaning kit. Be sure that the pad makes full contact with the end-face surfaces. Wait five seconds for the surfaces to dry and repeat.
- Step 2** Blow dry the connectors with canned, dry, oil-free, compressed air.
- Step 3** Use a magnifying glass to inspect the ferrule.
-

The connectors used inside the system have been cleaned by the manufacturer and connected to the adapters in the proper manner. The operation of the system should be error free if the customer provides clean connectors on the application side, follows the previous directions and ensures the following:

- Clean the connectors using lens tissues before connecting to the adapters. Use pure alcohol to remove soil.
- Do not clean the inside of the connector adapters.
- Do not use force or quick movements when connecting the fiber optic connectors in the adapters.

- Cover the connector adapters to avoid soiling or contaminating the inside of the adapters while cleaning the chassis.
- Cover the connectors and adapters to avoid the inside of the adapters or the surface of the connectors from getting dirty when not using the connectors.

**Note**

If the surface is not clean or does not have a uniform shine, repeat the process using a fresh surface of the alcohol pad.

Removing the Power Supply Module

This section describes how to power on the system, determine whether a power supply module (PSM) is faulty, and how to replace a PSM, if necessary.

**Warning**

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

The Cisco Metro 1500 series system has two identical, fully redundant PSMs. Each PSM can cover the power needs of the entire system. These PSMs provide 5V and 30A to the system. The PSM provides full input-to-output, input-to-case, and output-to-output isolation.

Power On/Off

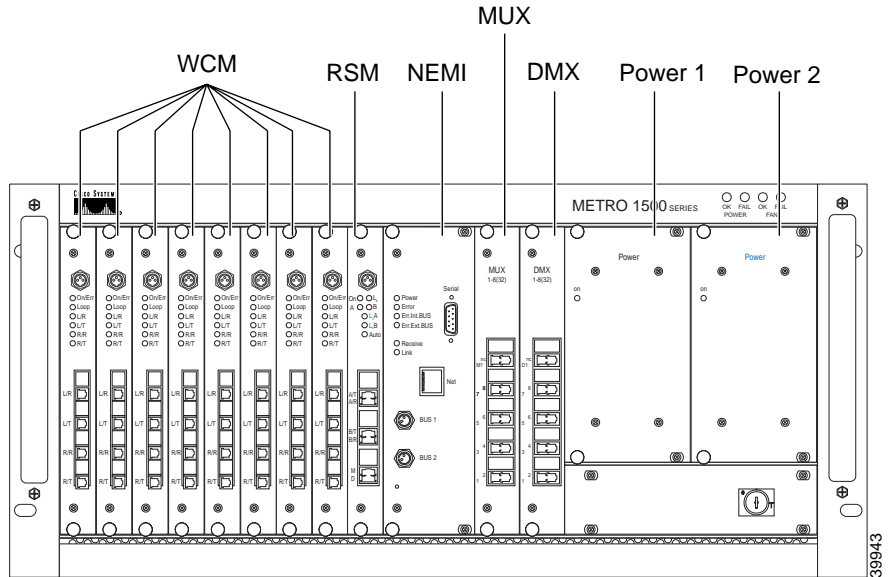
**Caution**

If powered off, wait at least 10 seconds before you switch the unit on again.

Turn the power on or off using the keyswitch on the AC-powered version only. (See Figure 3-10.) This switch supplies power to the redundant power supplies. You can only move the switch to the on (|) or off (0) position. Two keys are shipped with each unit and all units use the same key. You can remove the key in either the on or off position.

The display on the front panel of the chassis indicates whether the power is on or off. You can also monitor power status from the NEMI. For more information about monitoring the power supply from the NEMI, refer to the *Cisco Metro 1500 series Software Configuration Guide*.

Figure 3-10 Power Supply Modules



Determining Power Supply Status

If the LED on a power supply is off while the unit is powered on, and the power cable is plugged in the corresponding power socket, then either the cable is faulty, a fuse has blown, or the power supply itself has failed. To determine the possible cause of the failure, follow these steps:

-
- Step 1** Check the power cable to make sure that it is securely plugged into the unit. If the cable is correctly attached, go to Step 2.
- Step 2** Check the fuses by disconnecting the power cord and opening the fuse holder. If the fuses are okay, swap out the failed power supply module.
-

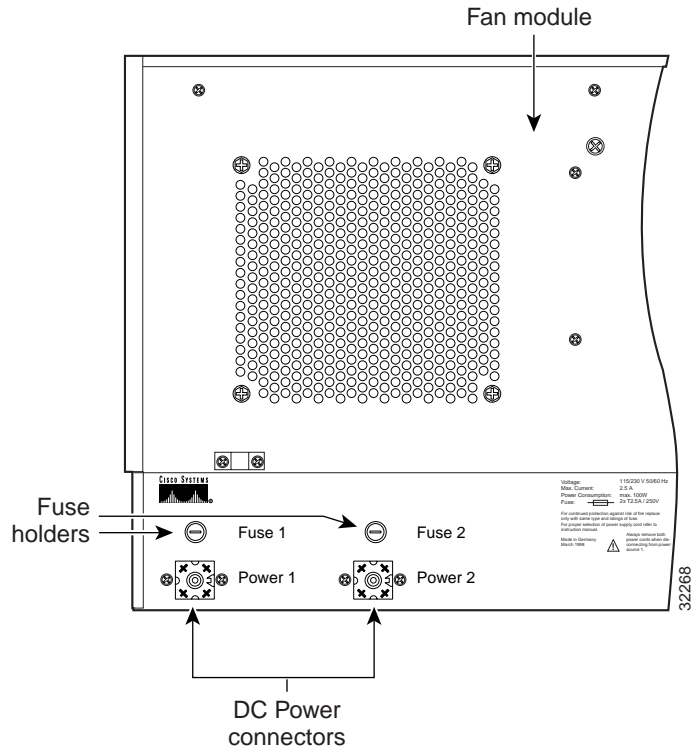
**Note**

Check and replace the failed unit as soon as possible. While you replace the faulty power supply, the redundant power supply continues to provide uninterrupted service.

**Note**

The power socket labeled Power 1 supplies current to the left power supply (Power 1). See Figure 3-11. The power socket labeled Power 2 supplies current to the right power supply (Power 2).

Figure 3-11 Rear View of Power Supply Module



All PSMs are hot-swappable and can be replaced while the system is in service. To replace a PSM, follow these steps:

-
- Step 1** Remove the power cord associated with the failed power supply and loosen the four panel screws.
 - Step 2** Pull out the malfunctioning module.
 - Step 3** Slide in the spare module.
 - Step 4** Check that the green LED is on.
 - Step 5** Reconnect the power cord.
 - Step 6** Tighten the four panel screws.
-

Running Online Tests



Note

The power levels cannot be checked without special measurement equipment because of the automatic laser shutdown (ALS). All power measurements must be done in-line because of ALS.

System checkout and online testing are usually performed during working hours. Be sure to coordinate these tasks with the Cisco authorized representative.

Online testing varies from site to site depending on the CPU, operating systems in use, and the local channels being connected.

Be sure to set up and run your test jobs before installing the unit. Test jobs must be set up and verified by the customer prior to the actual installation of the system. For test purposes, you can force the laser on by means of the network management system as described in the *Cisco Metro 1500 Series Software Configuration Guide*.



Note

If your test results of the remote link deviate from the results described in these steps and you cannot correct the problem, contact your service representative.

Verifying Connections

Although the optical side of the Cisco Metro 1500 series system is designed to be plug and play, it is common practice to verify input and output levels for the optical interfaces existing in a typical connection because optical connections are susceptible to dust and optical cables can be ruined by physical abuse.

Budget measurements should be carried out at points A and F to check whether the user equipment is correctly interfaced. The budget measurement at point A should be within the range specified on the Cisco Metro 1500 series label. Measurement at point E is required to check whether the attenuation over the long distance is within the power budget. Budget measurements at point C and point D, measured at the remote side, can be used to calculate loss-levels of the connecting fiber line. All channel modules leaving the factory are accompanied by a test report.

Measuring Channel Outputs and Channel Budgets

Channel module outputs, measured at entry to the MUX, point B, or exit of the DMX, point E, are practically constant for all channel cards, whereas measurements at the exit of the BSM (point C) or entry to the BSM (point D) can exhibit a variation of 0 to 2 dB.

**Note**

All power measurements must be done in-line because of ALS.

All measurements concerning budgets need modulated light. We recommend using an external modulated light source. Practically any low powered light source with roughly 100 MHz modulation can be used. If a need for an approved light source exists, contact your Cisco representative.

You need:

- A Cisco Metro 1500 series system
- Access to two Cisco Metro 1500 series systems under test already connected through optical fibers and RSMs (or fiber spools) depending on system configuration
- A short fiber jumper
- Access to ocmstate
- An optical power meter connected in-line through an optical coupler or an optical in-line power meter

If you have an external 100-MHz modulated light source, follow Steps 1 to 3 to measure channel output at point F:

-
- Step 1** Pick a pair of channel modules preferably without clock (or with a clock that can be disabled with the ocmstate command, since none of the currently delivered clocks will match).
- Step 2** Connect the light source output to the connector labeled L/R (local receiver) of the local channel module. As a result, the green LED of the local receiver of the channel module is on and the ALS starts working (every 10 seconds the LED for remote transmitting blinks shortly). However, the signal does not get looped back yet.

- Step 3** Use the `ocmstate` command to switch on the local loop. Now you can measure the output power at point F. Afterwards, switch off the local loop. To measure at points B or C, follow Steps 1 and 2 and then Step 4:
- Step 4** Use the `ocmstate` command to switch the remote laser to “forced ON” to overcome ALS. Then measure at points B and C. If you want to measure the input at points D or E, follow Steps 1, 2, and 3 and then Step 5.
- Step 5** Use `ocmstate` to activate the remote loopback on the remote side of the link.
-

The link comes up. All lasers and receivers at the channel module are on and the remote receiver and the remote transmitter at the channel module on the remote side of the link are on. The local transmitter at the channel module at the remote side of the link is also on to allow measurements.

In case you do not have an adequate external modulated light source, you can use the modulated light (100 MHz) of the pilot laser of the Cisco Metro 1500 series system’s RSM (only an option if your Cisco Metro 1500 series system is equipped with an RSM). In this case, in Step 2 you connect the local RSMs B/R (output of the pilot laser) to the connector labeled L/R (local receiver) of the channel module. The output of the pilot laser is sent against traffic.

**Note**

Do not forget to set or enable clocks, disable loopback and enable automatic mode for the RSM before putting the Cisco Metro 1500 series units into service.

Troubleshooting

If trouble occurs during installation, check Table 3-2 for a list of troubleshooting tips. If the solution is not in the table, contact your Cisco service representative.

Table 3-2 Troubleshooting Tips

Problem	Probable Cause	Solution
No power	No power is coming from the outlet.	Turn on power.
	Power cables are loose.	Check and reseal cables.
	Power supply modules are not engaged.	Fully engage modules.
Power alarm	No power is coming from one outlet.	Turn on power.
	One power cable is loose.	Check and reseal cables.
	Power supply fuse is blown.	Check and replace fuse.
Not receiving local data	Local channel is not online.	Place local channel online.
	Fiber-optic connectors are loose.	Check and reseal connectors.
	Tx-Rx connectors are not matched.	Switch Tx-Rx connectors.
	Connectors are dirty or blown.	Clean or replace connectors.
	Local cables are not properly seated.	Trace and properly connect cables.
	Local link power exceeds budget.	Troubleshoot and retest local link.
	Channel card is not connected.	Connect all required optical fiber cables to the channel card.
Fiber links are dirty or blown.	Clean or replace fiber cables.	

Table 3-2 Troubleshooting Tips (continued)

Problem	Probable Cause	Solution
Not receiving remote data	Fiber-optic connectors are loose.	Check and reseat connectors.
	Tx-Rx connectors are not matched.	Switch Tx-Rx connectors.
	Remote cables are not properly seated.	Trace and properly connect cable.
	Remote link power exceeds budget.	Troubleshoot and retest remote link.
	Channel card is not connected.	Connect all required optical fiber cables to the channel card.
	Fiber links are dirty or blown.	Clean or replace fiber cables.
Inactive line is not in standby mode	Link is not connected.	Connect all required optical fiber cables of the line to the channel card.
	Remote link power exceeds budget.	Troubleshoot and retest remote link.
	Fiber links are dirty or blown.	Clean or replace fiber cables.
No password prompt after entering a proper login name	A non-supported adapter is being used to connect to the Cisco Metro 1500 series serial port.	Use the supplied DB-9 to RJ-45 adapter or an adapter that includes DCD/DTR ¹ flow control and RTS/CTS ² flow control.

1. DCD/DTR = data carrier detect/data terminal ready
2. RTS/CTS = request to send/clear to send

